

Applicant : Reinhard Bruch et al.
Serial No. : 10/809,932
Filed : March 26, 2004
Page : 2 of 9

Attorney's Docket No.: 35690-501

Amendments to the Claims:

This listing of claims replaces all prior versions and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) ~~A system for determining the constituents of a sample, the system comprising:~~
a femtosecond terawatt laser radiation source configured to emit laser radiation through a sample;
an optical unit configured to receive light backscattered from the sample; and
a detection and analysis unit coupled to said optical unit for analyzing a spectral signature of the sample, the detection and analysis unit comprising one or more infrared and UV/VIS spectrometers, one or more photo-multipliers coupled to an air transient digitizer, and a data acquisition control unit coupled to the one or more spectrometers.
2. (Original) The system of claim 1, further comprising an optical fiber cable coupling said optical unit to said detection and analysis unit.
3. (Canceled).
4. (Original) The system of claim 1, wherein said detection and analysis unit further comprises a real-time computing system for identification and discrimination of at least one of the group comprising: aerosols, airborne bacteria, viruses, toxins, dust particles, pollen, water droplets, gaseous agents, and pollutants.
5. (Original) The system of claim 1, wherein said femtosecond terawatt laser radiation source is amplified by chirped pulse amplification.

Applicant : Reinhard Bruch et al.
Serial No. : 10/809,932
Filed : March 26, 2004
Page : 3 of 9

Attorney's Docket No.: 35690-501

6. (Original) The system of claim 1, wherein said femtosecond terawatt laser radiation source is a Ti:Sapphire laser configured to emit energy of approximately 300 mJ per pulse.

7. (Original) The system of claim 6, wherein said femtosecond terawatt laser radiation source has a pulse power of about approximately 3 and 4 TW with a pulse duration approximately of the order of 80 to 100 fs and a repetition rate of approximately 10 Hz.

8. (Original) The system of claim 1, wherein said femtosecond terawatt laser radiation source emits light within a spectral range approximately centered at 800 nm or 267 nm with a spectral width of approximately 20nm.

9. (Currently Amended) The system of claim 1, wherein said femtosecond laser radiation source emits laser pulses at a center wavelength of approximately 800nm and spectral width of 20 nm to create plasma filaments; and
~~wherein said femtosecond laser radiation source emits laser pulses at a wavelength of approximately 267nm.~~

10. (Original) The system of claim 1, wherein the detection and analysis unit is configured to detect airborne biological, chemical agents and water droplets by at least one technique chosen from the group comprising: differential absorption, Raman Raleigh and Mie scattering, fluorescence, fluorescence LIDAR measurements, ground-based LIDAR measurements, air-based LIDAR measurements, and Raman LIDAR measurements.

11. (Original) The system according to claim 1, wherein the detection and analysis unit is configured to provide 3D maps of detected molecules.

Applicant : Reinhard Bruch et al.
Serial No. : 10/809,932
Filed : March 26, 2004
Page : 4 of 9

Attorney's Docket No.: 35690-501

12. (Currently Amended) A method ~~for determining the constituents within a sample;~~
~~the method comprising the steps of:~~

providing a femtosecond terawatt laser radiation source configured to emit laser radiation at
approximately 267 nm through a sample;

capturing light backscattered from the sample; and

analyzing a spectral signature of the sample to determine its constituents.

13. (Original) The method of claim 12, wherein the analyzing step determines whether
the constituents include least one of the group comprising: aerosols, airborne bacteria, viruses,
toxins, dust particles, pollen, water droplets, gaseous agents, and pollutants.

14. (Original) The method of claim 12, further comprising the step of amplifying the
femtosecond terawatt laser radiation source using chirped pulse amplification.

15. (Original) The method of claim 12, wherein the femtosecond terawatt laser radiation
source is a Ti:Sapphire laser configured to emit energy of approximately 300 mJ per pulse.

16. (Original) The method of claim 12, further comprising the step of pulsing the
femtosecond terawatt laser radiation source at a power of about approximately 3 and 4 TW with a
pulse duration approximately of the order of 80 to 100 fs and a repetition rate of approximately 10
Hz.

17. (Currently Amended) The method of claim 12, wherein the femtosecond terawatt
laser radiation source emits light within a spectral range approximately centered at 800 nm ~~or 267~~
~~nm~~ with a spectral width of approximately 20nm.

Applicant : Reinhard Bruch et al.
Serial No. : 10/809,932
Filed : March 26, 2004
Page : 5 of 9

Attorney's Docket No.: 35690-501

18. (Currently Amended) The method of claim 12, wherein said femtosecond laser radiation source emits laser pulses ~~having a at a center wavelength of approximately 800nm and~~ spectral width of 20 nm to create plasma filaments; and

~~wherein said femtosecond laser radiation source emits laser pulses at a wavelength of approximately 267nm.~~

19. (Original) The method of claim 12, wherein the analyzing step uses at least one technique chosen from the group comprising: differential absorption, Raman Raleigh and Mie scattering, fluorescence, fluorescence LIDAR measurements, ground-based LIDAR measurements, air-based LIDAR measurements, and Raman LIDAR measurements.

20. (Original) A method according to claim 12, wherein the detection and analysis unit is configured to provide 3D maps of detected molecules.

21. (Original) A method according to claim 12, further comprising the step of comparing at least one of detected vibrational bands, detected Raman spectra, and fluorescence spectra, with previously measured spectral data to identify the constituents within the sample.

22. (Currently Amended) A system ~~for determining the constituents within a sample,~~
~~the system~~ comprising:

means for providing a femtosecond terawatt laser radiation source configured to emit laser radiation at approximately 267 nm through a sample;

means for capturing light backscattered from the sample; and

means for analyzing a spectral signature of the sample to determine its constituents.

23. (New) The system of claim 1, wherein said femtosecond laser radiation source emits laser pulses at a wavelength of approximately 267nm

Applicant : Reinhard Bruch et al.
Serial No. : 10/809,932
Filed : March 26, 2004
Page : 6 of 9

Attorney's Docket No.: 35690-501

24. (New) A method comprising:
providing a femtosecond terawatt laser radiation source configured to emit laser radiation through a sample;
capturing light backscattered from the sample by at least two photomultipliers;
analyzing at least one spectral signature of the sample to determine its constituents using at least two spectrometers coupled to the at least two photomultipliers; and
characterizing the constituents of the sample based on the analyzed spectral signature.
25. (New) A method as in claim 23, wherein the radiation source emits light at approximately 267 nm.
26. (New) An apparatus comprising:
a radiation source configured to emit laser radiation through a portion of the atmosphere and to generate a conducting plasma channel;
an optical unit configured to receive light backscattered from the portion of the atmosphere;
and
a detection and analysis unit coupled to the optical unit for analyzing a spectral signature of the portion of the atmosphere, the detection and analysis unit comprising an infrared spectrometer to measure a differential absorption in the portion of the atmosphere and an ultraviolet spectrometer for measuring absorption or fluorescence of the portion of the atmosphere.